

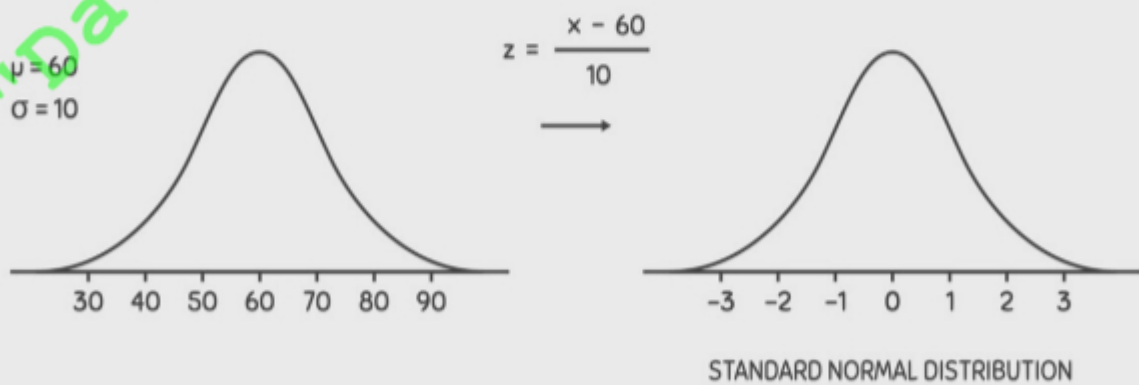
Z-Score

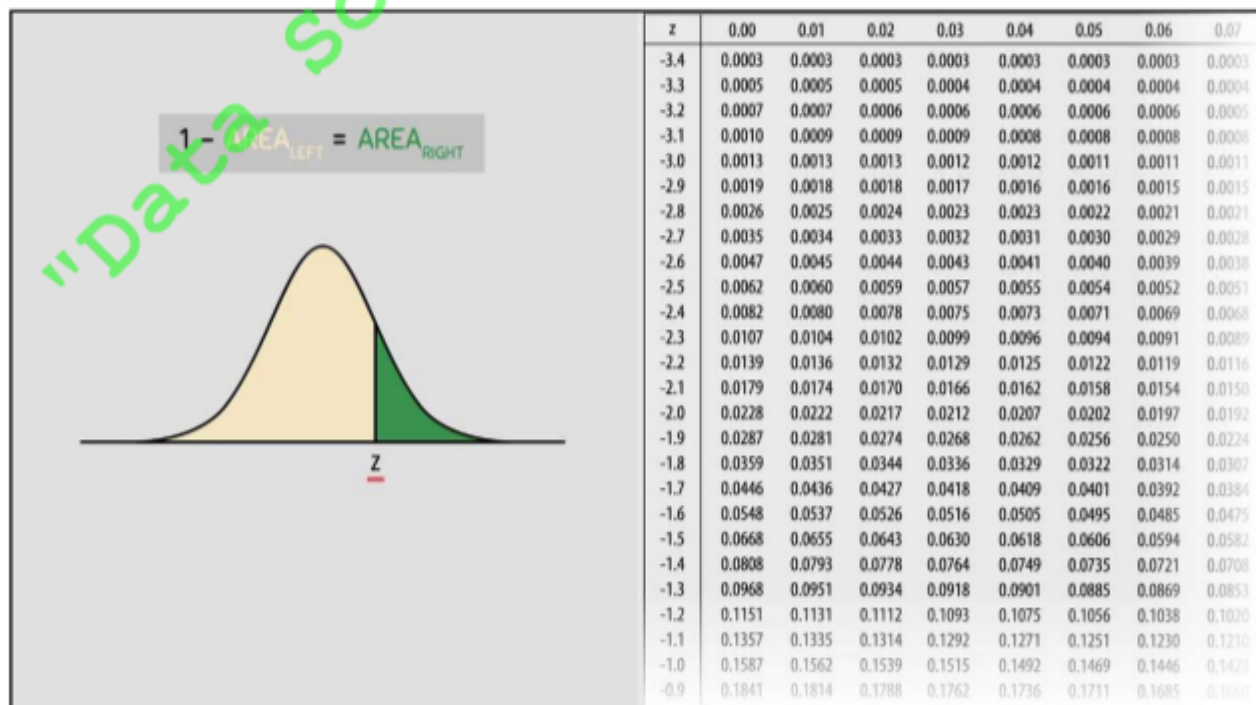
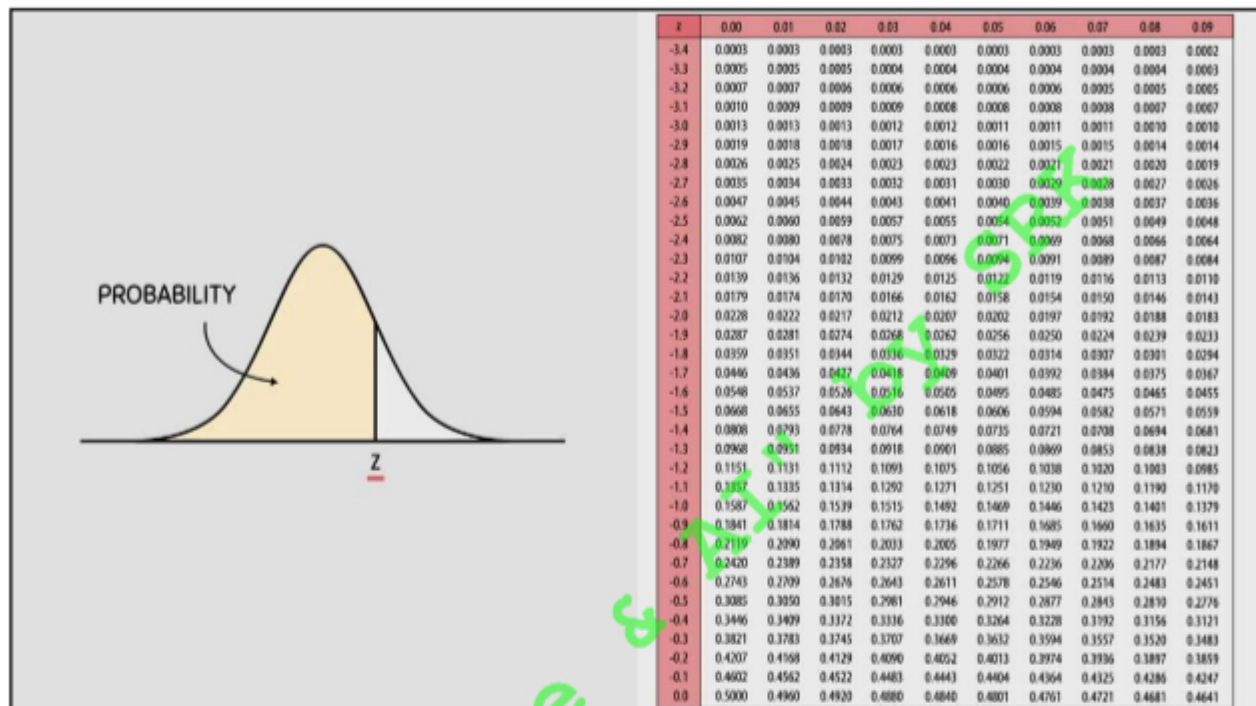
OBSERVATION
Z-SCORE
$$z = \frac{x - \mu}{\sigma}$$

STANDARDIZATION FORMULA

POPULATION MEAN
POPULATION STANDARD DEVIATION

Standardization



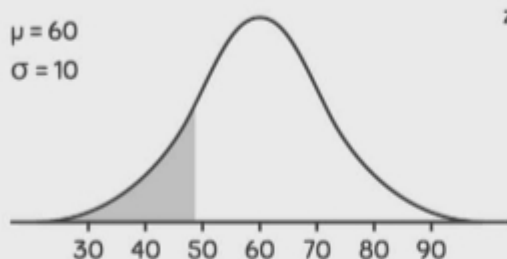


EXAMPLE

Suppose that we gathered data from last year's final chemistry exam and found that it followed a normal distribution with a mean of 60 and a standard deviation of 10. What proportion of students scored less than 49 on the exam?

$$P(X < 49) = ?$$

$$\mu = 60$$
$$\sigma = 10$$



$$z = \frac{x - 60}{10}$$



$$\mu = 0$$
$$\sigma = 1$$

STANDARD NORMAL DISTRIBUTION

by SRK

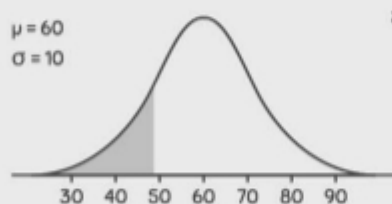
& AI

EXAMPLE

Suppose that we gathered data from last year's final chemistry exam and found that it followed a normal distribution with a mean of 60 and a standard deviation of 10. What proportion of students scored less than 49 on the exam?

$$P(X < 49) = ?$$

$$\mu = 60$$
$$\sigma = 10$$



$$z = \frac{x - 60}{10} =$$



$$P(Z < -1.1) = ?$$

$$\mu = 0$$
$$\sigma = 1$$

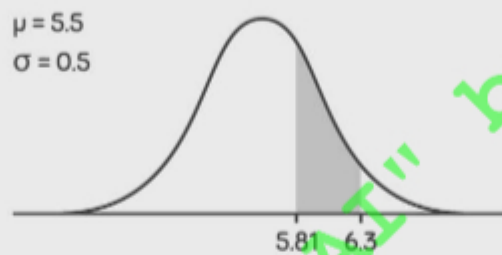


z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379

EXAMPLE

When measuring the heights of all students at a local university, it was found that it was normally distributed with a mean height of 5.5 feet, and a standard deviation of 0.5 feet. What proportion of students are between 5.81 feet, and 6.3 feet tall?

$$P(5.81 < X < 6.3) = ?$$

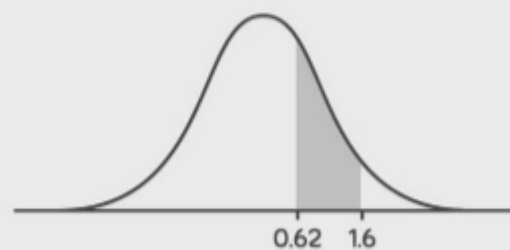
**EXAMPLE**

When measuring the heights of all students at a local university, it was found that it was normally distributed with a mean height of 5.5 feet, and a standard deviation of 0.5 feet. What proportion of students are between 5.81 feet, and 6.3 feet tall?

$$P(5.81 < X < 6.3) = 0.2128$$

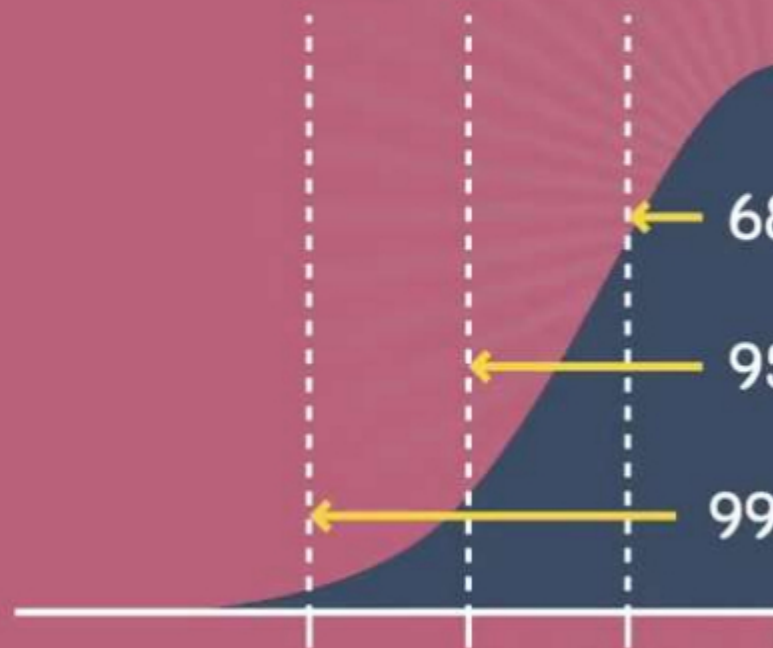


$$P(0.62 < Z < 1.6) = 0.2128$$



$$P(Z < 0.62) = 0.7324$$
$$P(Z < 1.6) = 0.9452$$

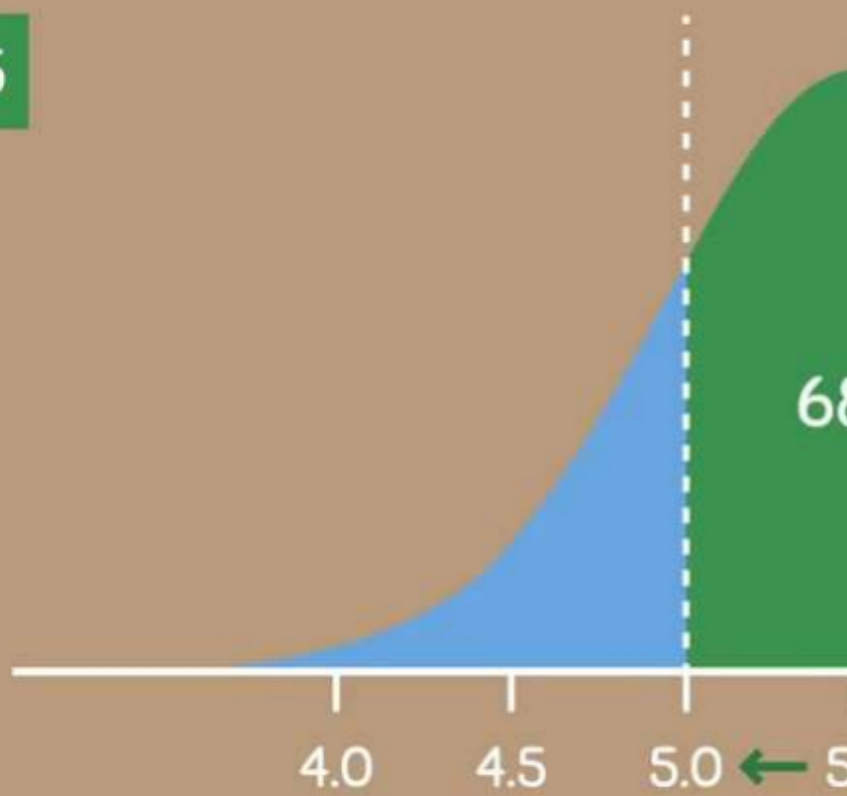
68-95-99



Science &

$$\mu = 5.5$$

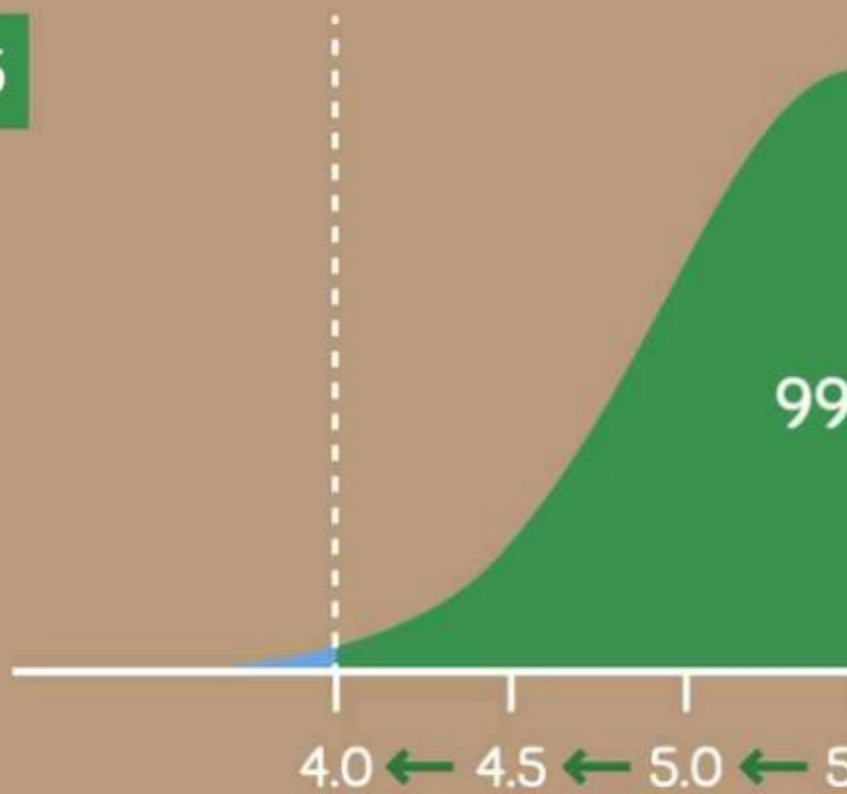
$$\sigma = 0.5$$



Science

$$\mu = 5.5$$

$$\sigma = 0.5$$



Science

PRACTICE QUESTIONS

- 1 The normal distribution below has a mean of 70. What area is contained between 70 and 80?

$$\mu = 70$$

$$\sigma = 10$$



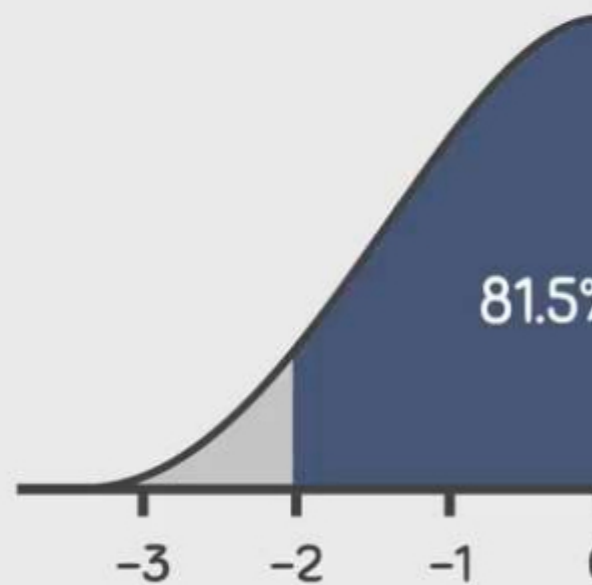
Science

PRACTICE QUESTIONS

- ② For the normal distribution below, a) between -2 and 1 ?

$$\mu = 0$$

$$\sigma = 1$$

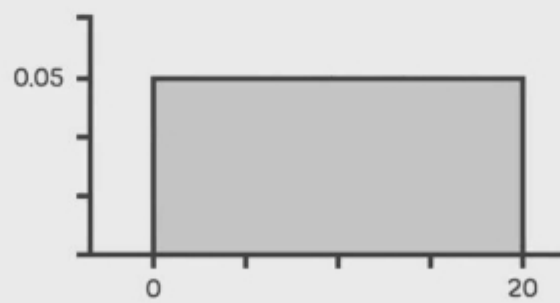


UNIFORM DISTRIBUTION



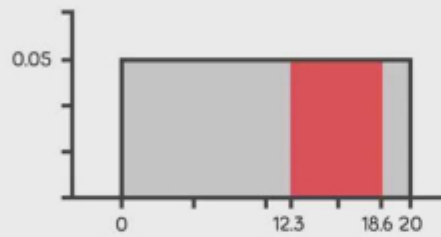
PRACTICE QUESTIONS

- ③ For the uniform distribution below, what proportion of values are located between 12.3 and 18.6?



PRACTICE QUESTIONS

- 3 For the uniform distribution below, what proportion of values are located between 12.3 and 18.6?



$$\begin{aligned}\text{Area} &= L \times W \\ &= 6.3 \times 0.05 \\ \text{Area} &= 0.315\end{aligned}$$

Probability Distribution

Probability Distribution

Graphical representation of variable & respective probabilities of variable.

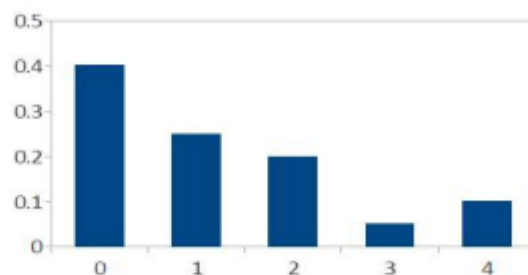
Types of Probability Distribution

- Discrete Probability Distribution
- Continuous Probability Distribution

Discrete Probability Distribution

The daily sales of large flat panel TVs at a store (X)

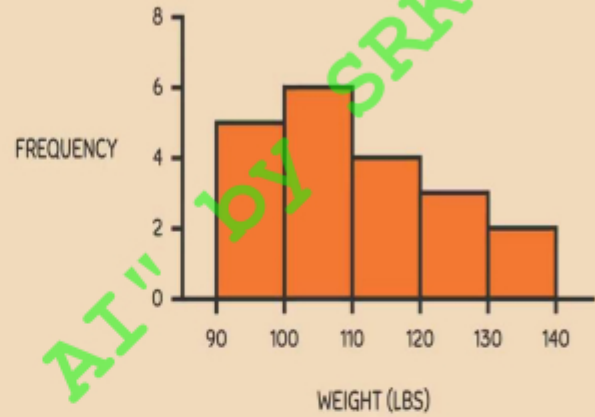
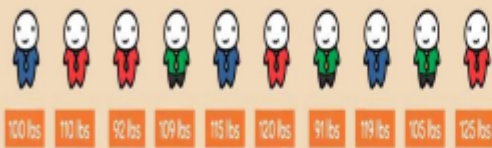
x	P(X=x)
0	0.40
1	0.25
2	0.20
3	0.05
4	0.10



What is the probability of a sale?

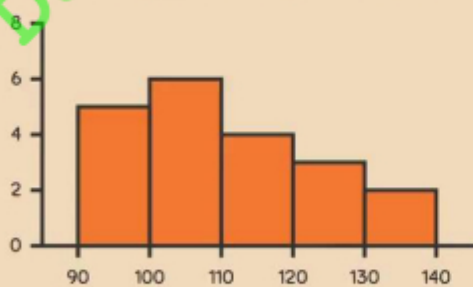
What is the probability of selling at least three TVs?

Continuous Probability Distribution

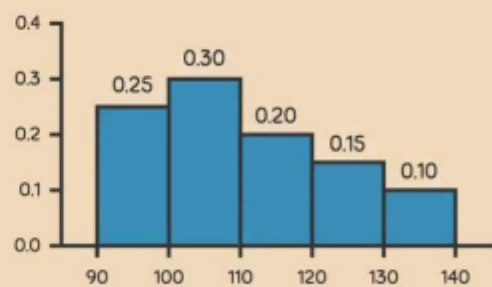


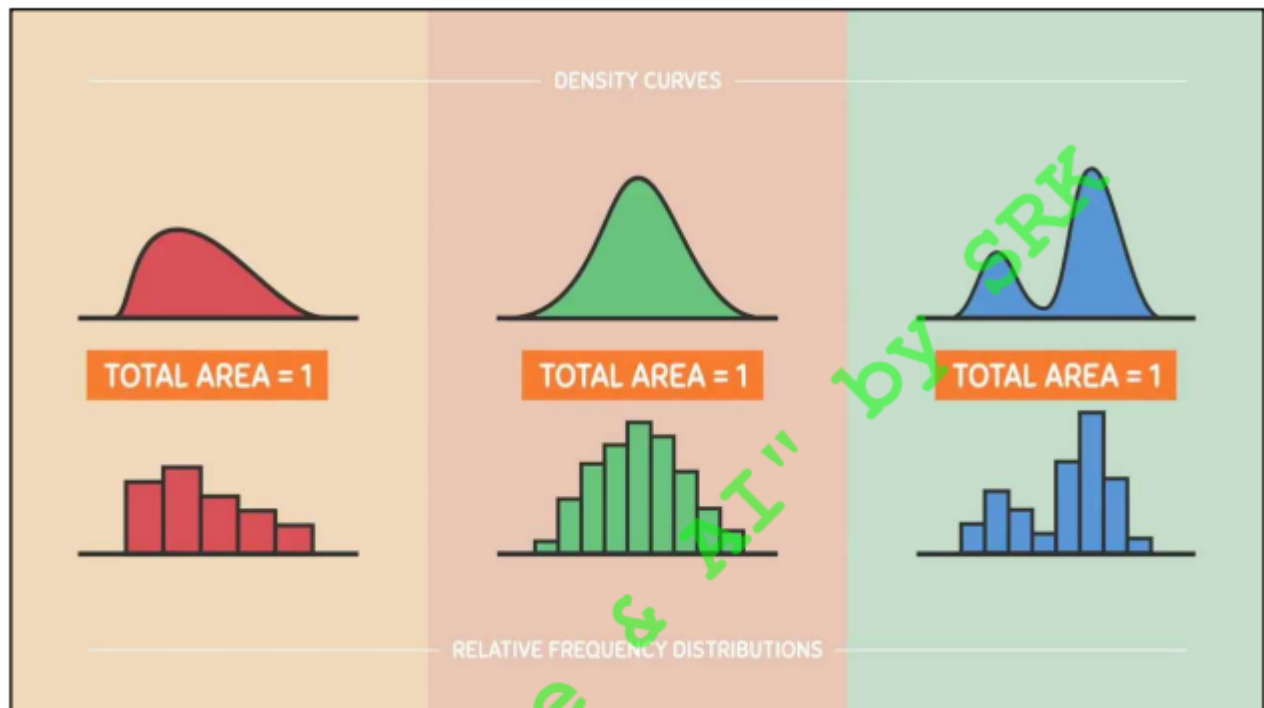
REVIEW

"REGULAR" FREQUENCY DISTRIBUTION



$n = 20$





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Probability

Variable :

- Chance of occurrence .
- Ex: rolling a die, tossing a coin

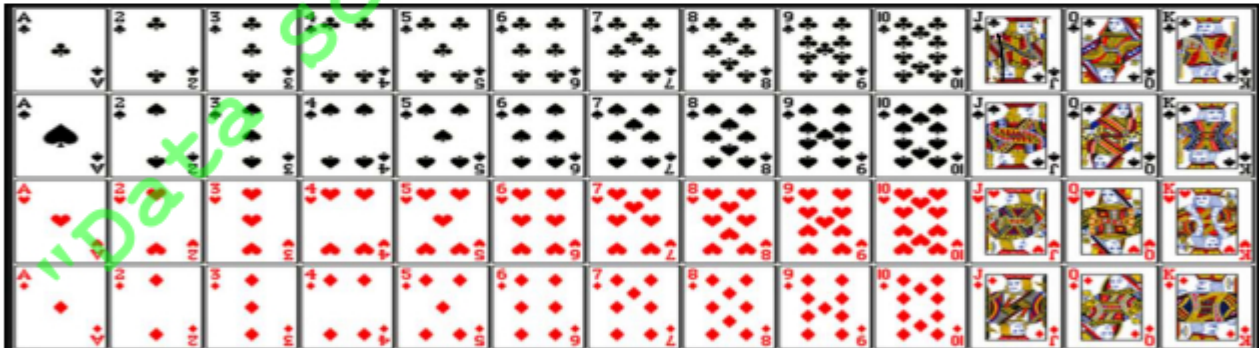
Random Variable:

A random variable is probability associated each possibility of variable .

It is a random because there is some chance associated with each possible value.

$$\text{Probability} = \frac{\text{No. of interested events}}{\text{total no. of outcomes}}$$

- Always probability value lies between 0 to 1.
- Sum of all Probabilities = 1



Suppose you have randomly picked a card from the card deck. What is the probability that this card will be?

- Bigger than 10?
- Equal to or Bigger than 10?
- Smaller than 3
- Greater than 4 and less than 8

If A & B are two independent events

$$P(A \& B) = P(A) * P(B)$$

Ex: probability of getting Red & 9

$$P(A \text{ or } B) = P(A) + P(B) - P(A \& B)$$

Ex: probability of getting Red or 9

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COVARIANCE

$$COV(x, y) = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n - 1}$$

CORRELATION

$$\rho_{X,Y} = \frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y}$$

where:

- cov is the covariance
- σ_X is the standard deviation of X
- σ_Y is the standard deviation of Y

CORRELATON

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

r = correlation coefficient

x_i = values of the x-variable in a sample

\bar{x} = mean of the values of the x-variable

y_i = values of the y-variable in a sample

\bar{y} = mean of the values of the y-variable

Range	Strength of association
0	No association
0 to ± 0.25	Negligible association
± 0.25 to ± 0.50	Weak association
± 0.50 to ± 0.75	Moderate association
± 0.75 to ± 1	Very strong association
± 1	Perfect association

